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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/021,676	12/12/2001	Matthew S. Ryskoski	2000.083300/TT4500	4732

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EXAMINER

PALADINI, ALBERT WILLIAM

ART UNIT PAPER NUMBER

2125

DATE MAILED: 03/05/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/021,676

Applicant(s)

RYSKOSKI, MATTHEW S.

Examiner

Albert W Paladini

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 12 December 2001.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-41 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-41 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____.
- 4) ☐ Interview Summary (PTO-413) Paper No(s) _____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 112

1. The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

2. Claims 1-41 are rejected under 35 U.S.C. 112, first paragraph, as containing subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention.

The claims are also rejected under 35 U.S.C. 112, first paragraph, as containing subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention.

The written description of the embodiments of the invention from pages 4-14 provides a generalized philosophical approach of a system used to obtain something called "item health metrics" and "tool health metrics," and then suggests that these elements might be uses in some way for "scheduling manufactured items for process flow." Some of the elements that might possibly constitute "item health metrics" and "tool health metrics" are listed, and names of possible procedures for obtaining "scheduling manufactured items for process flow" are given. The precise "metrics" used in the embodiment are not given No sensors for measurements of these "metrics" are not provided. The specification should contain a description of what data is obtained,

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the timing associated with obtaining the data, and which tools are used to obtain the data. The specification should also contain a detailed description of the logical processes used to convert the data obtained into scheduling procedures. It is not sufficient to provide a general objective, and then list possible types of data required to achieve this objective. Without providing all of the elements of the invention, the sequential logical interaction between each of the elements, and the precise methodology including the mathematical tools needed to analyze the measurement data and translate it into scheduling times; the description merely provides some generalized common sense thoughts about obtaining some data and predicting scheduling routines. It does not contain all of the elements needed for an invention. Some pertinent examples taken from the specification are provided below.

With respect to the "lot health metrics," lines 10-12 on page 10 state, "Various metrology information is collected during the fabrication of the lots. For example, physical measurements, such as transistor gate critical dimensions, particle contamination, process layer thickness, etc, may all be correlated by the lot health monitor 130 to a particular estimate of the performance grade and yield." The term "grade" is not defined. The phrase "may be correlated" is vague, and the description does not explain how the measurements are taken, how and at what point the yield is measured, and what form of correlation relationship is obtained and how it is used to estimate the desired parameters.

Lines 16-19 on page 10 states "The particular metrology information used by the lot health monitor to estimate grade as well as the nature of the graded variable may

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vary depending on the manufacturing item being produce and the market for such items. For example, memory devices may be graded differently than microprocessors.” It is not understood what is meant by the “nature of the graded variable” since “grade” was not defined. If the metrology information varies for different products, the specification must provide methodology to estimate the differences. No methodology for deriving mathematical or other models has been provided, but if a model was to be obtained to estimate desired parameters, the specification must provide specific techniques to obtain a new model, which results from variation of the graded variable.

Lines 1-13 on page 11 describe how the estimate yield or grade may change during its processing cycle, and discuss “wafers processed immediately after the cleaning cycle,” use of a “deposition tool,” reduced “particle contamination,” etc. Lines 9-11 state, “The increased particle contamination may also result in a lower anticipated yield for the lot, e.g., by increasing the number of short circuits. This is a general speculative statement of the possibility of an occurrence, which may occur, in some hypothetical manufacturing environment, but the specification does not provide a description of how this specific invention performs a function related to the possibility, nor does it provide the tools and analytical procedures needed to determine possible significant relationships.

Line 14 on page 11 through line 3 on page 12 imply that “preprocess and post-processing metrology information” may be used to update the estimated lot health metric,” but do not explain precisely how this information is obtained from specific measuring means, or the specific methods used to update the “lot health metric.”

Lines 15-19 on page 12 state "The tool health monitor 150 collects tool state trace data during processing runs of the monitored tool 30-80 to determine a tool health metric for the tool 30-80. One technique for monitoring the health of a particular tool 30-80 involves employing a multivariate tool health model adapted to predict the expected operating parameters of the tool during the processing of wafers in the tool." This does not describe the measurement equipment used to monitor the tools, the parameters measured, and the timing of the measurements. There is not definition of what a multivariate tool health model means, or how it predicts operating parameters. The term "multivariate" is an adjective meaning *having or involving more than one variable*. Regression Analysis and ANOVA or Analysis of Variance are two commonly used statistical tools to obtain estimates of correlations between variables in the form of variances, covariance, coefficients of correlation; using F statistics, chi square statistics, etc. If these are the tools implied in the specification, the objectives of the analysis, and the precise methodology must be provided. As written, the specific objective, apparatus, and methodology are not present in the application.

Lines 3-13 on page 13 refer to a tool health model provides in Patent Application 09/863,822 as an example of a tool health model to be used in this application. There is no explanation of how the referenced application may be used specifically in this application. In addition, since the reference may not evolve into a patent or publicly available, publication, it may not be used as a reference. In any case that a valid reference such as a textbook is utilized in a Patent Application, the Applicant must describe in detail how the elements of the reference specifically relate to the

elements of the Application. If a mathematical model is used, the Applicant must provide an explanation of the relationship of the referenced model to that in the Application.

Referring to the block diagram in figure 2, lines 1-2 on page 15 state "In block 230, the manufactured items are scheduled for processing the tools based on the health item metrics and the tool health metrics." The specification does not provide any methodology for scheduling processing tools based on the "health item metrics and the tool health metrics." First, as demonstrated in the previous paragraphs, these items have not been clearly defined, and the methodology for obtaining them has not been provided. There is also no mathematical model or methodology provided to translate metric data into scheduling data. If, somehow, these metrics were defined and obtained as variables; some systematic methodology such as a mathematical model is needed to convert the metric data into scheduling data. A queuing model might be appropriate, but the relationship between the metric or measurement units and the scheduling units must be provided.

Appropriate correction and clarification is required.

3. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter, which the applicant regards as his invention.

4. Claims 1-41 are rejected under 35 U.S.C. 112, second paragraph, as being incomplete for omitting essential elements and structural cooperative relationships of elements, such omission amounting to a gap between the necessary elements and structural connections. See MPEP § 2172.01.

Claim 1

Lines 3-4 recite “determining item health metrics for at least a subset of the plurality of manufactured items.” “Health metrics” is not defined. The claim does not recite any means for obtaining this parameter, and where in the manufacturing line, this determination is made, and how frequently this determination is made.

Line 5 recites “determining tool health metrics for a plurality of tools in the process flow.” “Health metrics” is not defined. The claim does not recite any means for obtaining this parameter, and where in the manufacturing line, this determination is made, and how frequently this determination is made.

Lines 6-7 recite “scheduling the manufactured items for processing in the tools based on the item health metrics and the tool health metrics.” Assuming that the item health metrics and the tool health metrics can be obtained, the claim does not recite how this data is used to schedule manufactured items for processing. A mathematical model might be a useful tool for this general function. However, if a mathematical tool were utilized, the objective of the scheduling would have to be clearly explained, and how the measurement parameters meet that objective would need to be understood.

Claim 21

Lines 3-4 recite “an item health monitor configured to determine item health metrics for at least a subset of the plurality of manufacturing items. “Health metrics” is not defined. The claim does not recite any means for obtaining this parameter, and

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where in the manufacturing line, this determination is made, and how frequently this determination is made.

Lines 5-6 recite “a tool health monitor configured to determine tool health metrics for at least a subset of the plurality of tools.” “Health metrics” is not defined. The claim does not recite any means for obtaining this parameter, and where in the manufacturing line, this determination is made, and how frequently this determination is made.

Lines –8 recite “a scheduling server configured to schedule the manufactured items for processing in the tools based on the item health metrics and the tool health metrics.” Assuming that the item health metrics and the tool health metrics can be obtained, the claim does not recite how this data is used to schedule manufactured items for processing. A mathematical model might be a useful tool for this general function. However, if a mathematical tool were utilized, the objective of the scheduling would have to be clearly explained, and how the measurement parameters meet that objective would need to be understood.

Claim 41

Lines 3-4 recite “means for determining item health metrics for at least a subset of the plurality of manufacturing items.” “Health metrics” is not defined. The claim does not recite and where in the manufacturing line, this determination is made, and how frequently this determination is made.

Line 5 recites “means for determining tool health metrics for a plurality of tools in the process flow. “Health metrics” is not defined. The claim does not recite and where in the manufacturing line, this determination is made, and how frequently this determination is made.

Lines 7-8 recite “means for scheduling the manufactured items for processing in the tools based on the item health metrics and the tool health metrics.” Assuming that the item health metrics and the tool health metrics can be obtained, the claim does not recite how this data is used to schedule manufactured items for processing. A mathematical model might be a useful tool for this general function. However, if a mathematical tool were utilized, the objective of the scheduling would have to be clearly explained, and how the measurement parameters meet that objective would need to be understood.

To be complete, the claims must recite the parameters are measured, how they are measured, where in the line they are measured, and how frequently they are measured. It must be clear from the claim or the specification how these measured parameters provide a scheduling method. Frequently, in this type environment, optimization procedures are utilized. In this case, the parameter to be optimized must be identified, and the equation, algorithm, or procedure must be provided. The phrase “based on the health metrics and the tool metrics” is broad and conceptual, and does not define and invention to perform the function with any precision.

Appropriate correction and clarification is required.

Claim Rejections - 35 USC § 103

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

6. Claims 1-41 are rejected under 35 U.S.C. 103(a) as being unpatentable over Nulman (6456894).

This rejection is made to the extent that the claims are understood. Since, as demonstrated in paragraphs 1-5, an invention was not clearly described in the specification or the claim recitation, this rejection addresses the gleaned goals of the invention.

In figure 3, Nulman discloses a method for scheduling production flow, where the manufacturing environment block monitors the manufactured items, and the tools used to produce these items. The data is fed to the SPC (statistical process control block) 112 flags out of control situations due to either item health or tool health. After being processed by the analysis block 116, the MES block schedules the manufacturing items for processing based on the item health metrics and the tool health metrics. Nulman states on lines 18-26 in paragraph 7 "The MES environment then determines whether the process of manufacturing environment 110 is within or outside the SPC control limits. A decision making function in MES environment 118 can then be invoked to decide whether or not to initiate intervention in manufacturing environment 110. Such

intervention can include aborting the run, adjusting parameters such as chamber pressure, scheduling additional wafers for processing or scheduling maintenance activities.” The correction requires changing the manufacturing parameters if the problem is an item health problem, or maintenance if the problem is a tool health problem. Nulman does not utilize “grade” and “yield”, but as described in paragraphs 1-5, “grade” is not understood.

“Yield” is a measure of the percent of good products emerging a production line. Statistical process control charts set up control limits, so that the system flags an out of control situation. An out of control situation occurs when too many manufactured items are not within their design control limits. It would have been obvious to one of ordinary skill in the art that the detection of an out of control situation by a statistical process control chart indicates a reduction in yield, so that an SPC is a measure of yield.

Relevant Prior Art

7. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Lilly (6088626) discloses a computerized system for scheduling work orders in a manufacturing environment which uses measured parameters such as resources and materials to schedule processing, where resources include workers, machines, and tools; and materials are product assemblies and subassemblies.

Frazer (6105520) discloses a scheduling system and method for the manufacturing of quilt, which includes an interactive scheduling module, which receives

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historical product data, machine health data such as work stoppages, and product quality details.


Crampton (6415196) discloses a manufacturing scheduling processing system, which utilizes a computer model to optimize the manufacturing flow, and which updates the model based upon real time tool and product measurements.

8. Any inquiry concerning this communication or earlier communication from the examiner should be direct to Albert W. Paladini whose telephone number is (703) 308-2005. The examiner can normally be reached from 7:30 to 4:00 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mr. Leo P. Picard, can be reached on (703) 308-0538. The official fax phone number for the organization where this application or proceeding is assigned is (703) 746-7239, and after final faxes should be directed to (703) 746-7238.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0956.

March 3, 2003


Albert W. Paladini
Primary Examiner
Art Unit 2125